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(54) **System for mixing and dispensing concrete**

System zum Mischen und Abgeben von Beton

Système pour mélanger et distribuer du béton

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Description

This invention relates to mobile systems for mixing and dispensing concrete. More specifically, this invention relates to an improved fin structure for use within the mixing drums in such systems which will increase the efficiency of a system, as well as lowering maintenance and manufacturing costs.

Concrete mixing trucks such as those manufactured by the applicant, McNeilus Truck and Manufacturing Corporation of Dodge Center, Minnesota, are widely used in the construction industry for preparing and transporting a concrete mixture to a desired construction site.

A mixing truck typically includes a rotatable mixing drum which has metallic fins or agitators mounted inside for mixing and directing the movement of a concrete mixture therein. Ordinarily, such fins have a helical configuration which will tend to mix concrete when the mixing drum is rotated in a first direction, and urged the concrete toward a discharge chute when the mixing drum is turned in an opposite direction.

During operation of such trucks, a great deal of abrasive friction is generated between the mixing fins and the various abrasive components of the concrete mixture which is being transported. As a result, mixing fins typically wear out long before the outer wall of the mixing drum itself does. Accordingly, a mixing drum must either be discarded or rebuilt with new fins if it is to achieve the full extent of its own design life. Such refitting is commonly done throughout the industry, and it is a relatively expensive, time-consuming process.

Another problem with metallic fins is their tendency to oxidize or corrode, which makes them difficult to clean after use. As a result, concrete often builds-up on the fins after such use. This reduces the usable volume of the drum and the efficiency of the fins during use. It also compounds the difficulty of cleaning the inside of the drum and the fins as time goes on.

Despite the above-noted problems, trucks with metallic mixing fins have been designed to operate fairly well in the past. However, it is generally recognised that the efficiency of a mixing system as a whole will be enhanced if such problems could be ameliorated.

It is clear, then, that there has existed a long and unfilled need in the art for mixing fins which have greater resistance to abrasion, which do not become roughened as they wear, and which are more lightweight than mixing fins which have been heretofore known.

It is known from US-A-3328006 to provide a concrete mixer drum, which is provided with internal spiral blades to mix the concrete upon rotation of the drum, and also to assist in the discharge of the concrete after mixing has been completed. However, the use of internally mounted blades (or fins) made of metal are subject to the disadvantages referred to above.

It is also known from EP-A-0211279 to provide mixing apparatus for mixing liquid and liquid suspension mediums, which comprises a rotatable impeller comprising a central drive shaft, and radially outwardly projecting impeller blades which promote mixing of the medium within the apparatus. All of the components of the impeller assembly are made of a composite of fibrous and plastics material, known as fibre-reinforced plastics (FRP).

US 2810558 discloses a concrete mixer including a drum with buckets fixed to the interior of the drum.

The Chamber Dictionary of Science and Technology provides a definition of the term "rubber".

According to the invention there is provided a concrete mixing drum assembly adapted for mounting in a mobile system and comprising:

a rotatable mixing drum having an outer wall with an inner surface defining an internal mixing space for mixing and dispensing concrete;

fin means for mixing and guiding the concrete within the mixing space, when the mixing drum is rotated; and

means for securing said fin mens to the inner surface of the outer wall of the drum;

characterised in that:

(a) said fin means includes at least one helical mixing fin comprising a lightweight, resilient, polyurethane-based polymeric material which is flexible and resistant to abrasion;

(i) said at least one helical mixing fin comprising, in cross-section, a substantially straight blade portion and a curved inner fin extension having an inside edge, said inside edge defining an orifice through which material may pass;
(ii) said at least one helical mixing fin including a rearwardly curving fin portion, a forwardly curving fin portion and a transitional fin portion between the rearwardly curving fin portion and the forwardly curving fin portion;
(iii) said at least one helical mixing fin comprising at least two separable fin sections joined to one another; and,

(b) said means for securing the fin means comprises a metal insert which is positioned with a portion thereof embedded within said at least one helical mixing fin; said metal insert including a portion for connecting to said outer wall.

Preferred embodiments of concrete mixer drum assemblies according to the invention will now be described in detail with reference to the accompanying drawings, in which:

Figure 1 is a side elevational view of a mobile system for mixing and dispensing concrete according to a first preferred embodiment of the invention;
Figure 2 is a fragmentary elevational view of a portion of the mixing system illustrated in Figure 1;
Figure 3 is a cross sectional view taken along lines 3-3 in Figure 2;

Figure 4 is a cross sectional view taken along lines 4-4 in Figure 3;

Figure 5 is a cutaway view illustrating a portion of the structure shown in Figure 3;

Figure 6 is a cross sectional view taken along lines 6-6 in Figure 3;

Figure 7 is a cross sectional view similar to that depicted in Figure 6, which shows an alternative embodiment of the feature of the invention which is illustrated in Figure 6; and,

FIGURE 8 is a cross sectional view similar to Figure 4, which shows an alternative embodiment to the structure depicted in Figure 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Referring now to the drawings, wherein like reference numerals designate corresponding structure throughout the views, and referring in particular to Figure 1, a mixing truck 10 constructed according to a first preferred embodiment of the invention includes a cab portion 12 and a rear portion 14 which has a main frame 16. A mixing drum 18 is mounted for rotation on a front support frame 20 and rear support frame 22, both of which are integral with main frame 16. A rearward portion of mixing drum 18 is positioned adjacent a discharge mechanism 24 which includes a funnel for loading concrete components into mixing drum 18 as well as a portion for guiding mixed concrete into a main chute 26, as is well known in the art. Main chute 26 is supported relative to rear support frame 22 by a pivot joint 28, which enables main chute 26 to be positioned over a set of forms or other desired location for the mixed concrete. It will be appreciated by those skilled in the art that the other various details of truck 10, including but not limited to the engine, drive train and hydraulic system for operating mixing drum 18, are well known and readily available to the skilled artisan.

As may be seen in Figures 1 and 2, mixing drum 18 includes a head portion 31, a front cone portion 30, a belly portion 32, and a rear cone portion 34 which terminates at the end of truck 10 which supports the discharge mechanism 24. An improved helical mixing fin 36 is mounted to an inner surface of an outer wall 38 of mixing drum 18, as will be described in greater detail below. As may be seen in Figure 2, mixing fin 36 includes a rearwardly curving fin portion 37, a forwardly curving fin portion 39 which preferably is in head portion 31 and front cone portion 30, and a transitional fin portion 41 which connects the rearwardly curving portion 37 and the forward curving portion 39. It will be appreciated that a concrete mixture will be agitated by the fin portions 37, 39, 41 when mixing drum 18 is caused to rotate in a first direction, while the fin portions will urge the mixture toward discharge mechanism 24 when the mixing drum 18 is rotated in a second, opposite direction. The forwardly curving fin portion 39 acts to help lift and toss the mixture toward the middle of drum 18 when drum 18 is rotated to mix the material.

Referring now to Figure 3, the various portions of helical mixing fin 36 are secured to the wall 38 of mixing drum 18 by a metal insert 40, in a manner that will be described below in further detail with reference to Figures 4, 5 and 8. As may be seen in Figures 3 and 4, the helical mixing fin 36 includes a fin portion 42 which is fabricated from a lightweight polymeric material. Preferably, plastic fin portion 42 is fabricated from a fiber reinforced polymer which is relatively lightweight and which will tend to remain smooth after wear. The most preferred material at the time application for patent was made is polyurethane, although it is to be understood that nylons and other polymers having the requisite characteristics could just as preferably be used. Preferably, the polymer used to form plastic fin portion 42 is also fiber-reinforced for greater strength. It is important that the outer surfaces of fin portion 42 be smooth, so as to facilitate efficient removal of material from the fins after use.

As may be seen in Figure 3, mixing fin 36 is made up of several sections, among them a first fin section 44 and a second fin section 46. The different sections 44, 46 are joined together by a number of fin connection joints 48, one of which is shown in cross section in Figure 6 and will be described in greater detail below.

Looking now to Figure 5, a first preferred embodiment of metal insert 40 includes a number of substantially flat anchor members 50, which are formed in the shape of a truncated triangle. Each of the anchor members 50 are flexibly connected to adjacent anchor members 50 via a connecting hoop portion 52. The connecting hoop portions 52 are preferably unitary with anchor members 50 and are formed of a resilient metallic material such as steel. Each of the anchor members 50 has a first side surface 54 and a second side surface 56 which is opposite the first side surface 54 of an adjacent anchor member 50. The anchor members 50 further each have a planar end surface 58 which is adapted for connecting to the outer wall 38 of mixing drum 18 in a manner that will be described in greater detail below. Periodically along the length of insert 40 are anchor members which have a second type of first side surfaces 60 and adjacent second side surfaces 62. The modified type of first side surface 60 includes a recessed surface 64 that is opposite a second recessed surface 66 in the modified first side surface 60. The first recessed surface 64 and second recessed surface 66 together define a washout hole 68 through which fluid may pass. Washout holes 68 are particularly advantageous when the interior of mixing drum 18 is rinsed out after use.

Referring now to Figure 4, mixing fin 36 includes an inside edge 70 which defines an orifice through which material may pass. This orifice is visible in Figure 3. As may be seen in Figure 4, mixing fin 36 includes, in cross section, a curved inner fin portion 72 which is defined by a first outer surface 74 and a first inside surface 76. Unitary with curved inner fin portion 72 is a reinforced bend portion 78 which is defined by a second inside surface

80 and a radiused outer surface 82. A substantially straight blade portion 84 is unitary with a second end of reinforced bend portion 78, and is defined by a second outer surface 86 and a third inside surface 88. An anchor portion 90 is unitary with blade portion 84 and is molded about the metal insert 40, as is discussed above with reference to Figure 5. The end surfaces 58 of the various anchor members 50 in metal insert 40 are secured to the outer wall 38 of mixing drum 18 via a fillet weld 92.

In constructing mixing fin 36 out of a polymeric material, the optimum thickness of curved inner fin portion 72 is considered to be within the range of 0.5 inches - 3 inches, with a most preferred dimension of 1.125 inches. The preferred thickness of reinforced bend portion 78 is from 0.5 inches - 1.5 inches, with a preferred thickness of 0.875 inches. Blade portion 84 is preferably constructed to be 0.35 inches, but may thick as 1 inch. Anchor portion 90 may be between 0.5-1 inches thick, with a preferred thickness of 0.875 inches. Fillet welds 92 preferably have a radius from 3/16 - 1/4 inch.

Looking now to Figure 6, the construction of a fin connection joint 48 will now be described. As is shown in Figure 6, second fin section 46 is provided with a reinforced offset portion 96 which has a step defined therein for receiving an end portion of first fin section 44. Reinforced offset portion 96 has a countersunk recess 98 defined therein for receiving the head 102 of a bolt 100. Bolt 100 passes through a bore defined in reinforced offset portion 96 and a matching bore in first fin section 44. A reinforcement strip 104 extends along an interface between the first fin section 44 and second fin section 46. Bolt 100 extends through a bore in reinforcement strip 104, as is shown in Figure 6. A countersunk recess 106 is defined in an outside surface of reinforcement strip 104 for receiving a nut 108 which threadedly engages bolt 100 so as to secure reinforcement strip 104, first fin section 44, and the reinforced offset portion 96 of second fin section 46 as a single unit. The advantage provided by countersunk recesses 98, 106 is that concrete mixture is less likely to adhere to head 102 and nut 108.

Referring now to Figure 7, an alternative construction of fin connection joint 48 will now be described. In this embodiment, first fin portion 44 is provided with a snap socket 110 and second fin section 46 is provided with a snap element 112. A first stepped circular recess 114 is defined in first fin section 44 for receiving a second, circular pawl 120 of snap element 112. Likewise, a second, stepped recess 116 is defined in second fin section 46 for receiving a first, circular pawl 118 which is partially defined by the stepped recess 116 on snap socket 110. First pawl 118 is constructed to be engaged by second pawl 120 when snap element 112 is urged toward snap socket 110. Such urging is effected by a locking key 128 which is insertable into a gap between first fin section 44 and the second pawl 120 of second fin section 46. As may be seen in Figure 7, snap element 112 is preferably supported on an offset portion 122 of second fin section 46. The offset portion 122 supports a lower surface 124 of first fin section 44 by means of a flat surface 126 which is adapted to bear against lower surface 124.

Looking now to Figure 8, an alternative embodiment to the structure previously discussed with reference to Figure 4 will now be described. In the embodiment of Figure 8, an alternative fin mounting arrangement 130 includes a mounting insert 132 which is molded into a thickened base portion 134 of mixing fin 36. Mounting insert 132 is in the preferred mode a metallic washer-shaped element that is welded to outer wall 38 of the mixing drum 18 by a weld bead 138. An access hole 136 is defined in base portion 134 to provide access to mounting insert 132 for welding and removal should removal ever become necessary. The position of insert 132 relative to blade portion 84 may alternate along the length of blade portion 84. In other words, a mounting arrangement which is adjacent to arrangement 130 might appear to the left of blade portion 84 in a section view taken from the same direction as Figure 8.

In operation, the flexible plastic mixing fin according to the invention has a smooth, slippery surface which prevents concrete from adhering and forming buildup deposits of hardened concrete. Also, since the polymeric material has good wearability and strength characteristics relative to their weight, it is possible to make the mixing fins thick enough to outwear the outer wall 38 of mixing drum 18, while weighing less than metallic mixing blades which were heretofore used. A further advantage to the plastic mixing blades according to the invention is that they can be easily molded to any shape and thickness. This allows them to be molded thicker at points where greater strength and stiffness are needed, at less expense than would be required to similarly form metallic blades.

Claims

1. A concrete mixing drum assembly adapted for mounting in a mobile system and comprising:

a rotatable mixing drum (18) having an outer wall with an inner surface defining an internal mixing space for mixing and dispensing concrete;

fin means (36) for mixing and guiding the concrete within the mixing space, when the mixing drum is rotated; and

means (40) for securing said fin means to the inner surface of the outer wall (34) of the drum; characterised in that:

(a) said fin means includes at least one helical mixing fin comprising a lightweight, resilient, polyurethane-based polymeric material which is flexible and resistant to abrasion;

(i) said at least one helical mixing fin comprising, in cross-section, a substantially straight blade portion (84) and a curved inner fin extension (72) having an inside

edge (70), said inside edge defining an orifice through which material may pass;
(ii) said at least one helical mixing fin including a rearwardly curving fin portion (37), a forwardly curving fin portion (39) and a transitional fin portion (41) between the rearwardly curving fin portion (39) and the forwardly curving fin portion (37);
(iii) said at least one helical mixing fin comprising at least two separable fin sections joined to one another; and,

(b) said means (40) for securing the fin means comprises a metal insert (40, 132) which is positioned with a portion thereof embedded within said at least one helical mixing fin; said metal insert (40, 132) including a portion for connecting to said outer wall.

2. An assembly according to claim 1 characterised in that said fin means (36) is constructed from a fibre-reinforced polymer.

3. An assembly according to claim 1 characterised in that said curved inner fin extension (72) comprises a thickened reinforced bend portion (78) at a location where said curved inner fin extension is joined to said blade portion (64).

4. An assembly according to claim 3 characterised in that said fin means includes at least one bolt/nut connection (100, 108) which extends through the at least two separable fin sections (44, 46) to join them together.

5. An assembly according to claim 4 characterised in that one of the separable fin sections (46) has a reinforced offset portion (90) for supporting an end of the separable fin section (44) to which it is joined; and, the bolt/nut connection (100, 108) extends through said reinforced offset portion (96).

6. An assembly according to claim 5, further characterised by a reinforcement strip (104) extending along an interface between the separable fin sections (44, 46); said bolt/nut connection (100, 108) extending through said reinforcement strip.

7. An assembly according to claim 1 characterised in that said at least two separable fin sections are joined by a snap pin joint.

8. An assembly according to claim 8 characterised in that a locking key (128) is positioned to secure said snap pin joint in a fastened positioned.

9. An assembly according to claim 1 characterised in that said means for securing includes a weld connecting said metal insert to said outer wall.

10. An assembly according to claim 1 characterised in that said metal insert (40) comprises a plurality of anchor members (50); and, a plurality of flexible members (52) joining said anchor members (50).

Patentansprüche

1. Beton-Mischtrommel-Anordnung, die zur Befestigung auf einem mobilen System ausgelegt ist und folgende Teile umfaßt:
eine drehbare Mischtrommel (18), die eine Außenwand mit einer Innenfläche hat, die einen inneren Mischraum zum Mischen und Abgeben von Beton bildet;
eine Leitblechvorrichtung (36) zum Mischen und Leiten des Betons innerhalb des Mischraumes dann, wenn die Mischtrommel gedreht wird; und
eine Vorrichtung (40) zum Befestigen der Leitvorrichtung an der Innenfläche der Außenwand (34) der Trommel, dadurch gekennzeichnet, daß:

(a) die Leitvorrichtung wenigstens eine schraubenförmige MischLeiteinrichtung aufweist, die aus einem leichten, nachgiebigen und auf Polyurethanbasis aufgebauten, polymeren Material besteht, das flexibel und abriebfest ist;

(i) wobei wenigstens eine schraubenförmige Mischleiteinrichtung im Querschnitt einen im wesentlichen geraden Leitflügelabschnitt (84) und eine gekrümmte, innere Leiteinrichtungsverlängerung (72) aufweist, die ihrerseits eine Innenkante (70) hat, die wiederum eine Öffnung bildet, durch die Material hindurchgehen kann;
(ii) wobei wenigstens eine schraubenförmige Mischleiteinrichtung einen nach hinten gekrümmten Leiteinrichtungsabschnitt 37, einen nach vorne gekrümmten Leiteinrichtungsabschnitt (39) und einen Übergangs-Leiteinrichtungsabschnitt (41) zwischen dem nach hinten gekrümmten Leiteinrichtungsabschnitt (39) und dem nach vorne gekrümmten Leiteinrichtungsabschnitt (37) aufweist;
(iii) wobei wenigstens eine schraubenförmige Mischleiteinrichtung wenigstens zwei trennbare Leiteinrichtungsabschnitte aufweist, die miteinander verbunden sind; und

(b) daß die Vorrichtung (40) zum Befestigen der Leitvorrichtung einen Metalleinsatz (40, 132) aufweist, der mit einem Abschnitt davon innerhalb der wenigstens einen, schraubenförmigen Mischleiteinrichtung eingebettet ist, und wobei der Metalleinsatz (40, 132) einen Abschnitt zur Verbindung mit der Außenwand aufweist.

2. Anordnung nach Anspruch 1, dadurch gekennzeichnet, daß die Leitvorrichtung (36) aus faserverstärktem Polymer hergestellt ist.

3. Anordnung nach Anspruch 1, dadurch gekennzeichnet, daß die gekrümmte, innere Leiteinrichtungsverlängerung (72) einen verdickten, verstärkten gebogenen Abschnitt (78) an einer Stelle aufweist, an der die gekrümmte, innere Leiteinrichtungsverlängerung mit dem Leitflügelabschnitt (84) verbunden ist.

4. Anordnung nach Anspruch 3, dadurch gekennzeichnet, daß die Leitvorrichtung wenigstens eine Schrauben-Mutterverbindung (100, 108) aufweist, die sich durch wenigstens zwei trennbare Leiteinrichtungsteile (44, 46) hindurch erstreckt, um sie miteinander zu verbinden.

5. Anordnung nach Anspruch 4, dadurch gekennzeichnet, daß eines der trennbaren Leiteinrichtungsteile (46) einen verstärkten versetzten Abschnitt (90) zum Abstützen eines Endes desjenigen trennbaren Leiteinrichtungsteiles (44) hat, mit dem es verbunden ist und daß sich die Schrauben-Mutterverbindung (100, 108) durch den verstärkten versetzten Abschnitt (96) hindurch erstreckt.

6. Anordnung nach Anspruch 5, die weiter durch einen Verstärkungsstreifen (104) gekennzeichnet ist, der längs einer Vervindungsstelle zwischen den trennbaren Leiteinrichtungsteilen (44, 46) verläuft, wobei sich die Schrauben-Mutterverbindung (100, 108) durch den Verstärkungsstreifen hindurch erstreckt.

7. Anordnung nach Anspruch 1, dadurch gekennzeichnet, daß die wenigstens zwei trennbaren Leiteinrichtungsteilen mit Hilfe einer Schnapp-Stiftverbindung verbunden sind.

8. Anordnung nach Anspruch 7, dadurch gekennzeichnet, daß ein Verriegelungsteil (128) vorgesehen ist, um die Schnapp-Stift-Verbindung in ihrer Befestigungsstellung zu halten.

9. Anordnung nach Anspruch 1, dadurch gekennzeichnet, daß die Sicherungsvorrichtung eine Schweißung aufweist, die den Metalleinsatz mit der Außenwand verbindet.

10. Anordnung nach Anspruch 1, dadurch gekennzeichnet, daß der Metalleinsatz (40) mehrere Ankerteile (50) aufweist, sowie mehrere, biegsame Teile (52), die die genannten Ankerteile (50) miteinander verbinden.

Revendications

1. Ensemble à tambour pour le mélange du béton, agencé pour être monté dans un système mobile et comprenant :
un tambour de mélange apte à tourner(18) comportant une paroi extérieure avec une surface intérieure définissant un espace interne de mélange pour le mélange et la distribution du béton;
des moyens en forme d'ailettes (36) pour le mélange et le guidage du béton à l'intérieur de l'espace de mélange, lorsque le tambour de mélange tourne; et des moyens (40) pour fixer lesdits moyens en forme d'ailettes à la surface intérieure de la paroi extérieure (34) du tambour; caractérisé en ce que

(a) lesdits moyens en forme d'ailettes comprennent au moins une ailette hélicoïdale de mélange formée d'un matériau polymérique léger, élastique, à base de polyuréthane, qui est flexible et résistant à l'abrasion;

(i) au moins ladite ailette hélicoïdale de mélange comprenant, en coupe transversale, une partie en forme de lame essentiellement rectiligne (84) et un prolongement intérieur courbe (72) de l'ailette, qui comporte un bord intérieur (70), ledit bord intérieur définissant un orifice par lequel le matériau peut passer;
(ii) au moins ladite ailette hélicoïdale de mélange comprenant une partie d'ailette (37) incurvée vers l'arrière, une partie d'ailette (39) incurvée vers l'avant et une partie de transition (41) de l'ailette située entre la partie d'ailette (39) incurvée vers l'arrière et la partie d'ailette (37) incurvée vers l'avant;
(iii) au moins ladite ailette hélicoïdale de mélange comprenant au moins deux sections d'ailette séparables réunies l'une à l'autre; et

(b) lesdits moyens (40) pour fixer les moyens en forme d'ailettes comprennent un insert métallique (40,132), qui est positionné de telle sorte qu'une partie de cet insert est encastrée au moins dans ladite ailette hélicoïdale de mélange; ledit insert métallique (40, 132) comprenant une partie destinée à se raccorder à ladite paroi extérieure.

2. Ensemble selon la revendication 1, caractérisé en ce que lesdits moyens en forme d'ailettes (36) sont formés d'un polymère renforcé par des fibres.

3. Ensemble selon la revendication 1, caractérisé en ce que ledit prolongement intérieur courbe (72) de l'ailette comprend une partie coudée épaissie et ren-

forcée (78) en un emplacement où ledit prolongement intérieur courbe de l'ailette est réuni à ladite partie en forme de lame (84).

4. Ensemble selon la revendication 3, caractérisé en ce que lesdits moyens en forme d'ailette comprennent au moins une liaison boulon/écrou (100,108) qui s'étend à travers au moins les deux sections séparables (44,46) de l'ailette pour les réunir entre elles.

5. Ensemble selon la revendication 4, caractérisé en ce que l'une des sections séparables (46) de l'ailette comporte une partie décalée renforcée (90) destinée à supporter une extrémité de la section séparable (44) de l'ailette, à laquelle elle est réunie; et la liaison boulon/écrou (100, 108) s'étend à travers ladite partie renforcée décalée (96).

6. Ensemble selon la revendication 5, caractérisé, en outre, par une bande de renfort (104) qui s'étend le long d'une interface entre les sections séparables (44,46) de l'ailette; ladite liaison boulon/écrou (100,108) s'étendant à travers ladite bande de renfort.

7. Ensemble selon la revendication 1, caractérisé en ce que, au moins lesdites deux sections séparables de l'ailette sont réunies par une articulation à tourillon à déclic.

8. Ensemble selon la revendication 8, caractérisé en ce qu'une clavette de blocage (128) est positionnée de manière à bloquer ladite articulation à tourillon à déclic dans une position fixée.

9. Ensemble selon la revendication 1, caractérisé en ce que lesdits moyens de fixation comprennent une soudure reliant ledit insert métallique à ladite paroi extérieure.

10. Ensemble selon la revendication 1, caractérisé en ce que ledit insert métallique (40) comprend une pluralité d'éléments d'ancrage (50); et une pluralité d'éléments flexibles (52) réunissant lesdits éléments d'ancrage (50).

FIG. 1

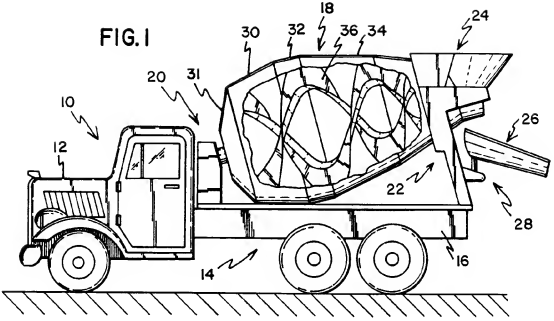
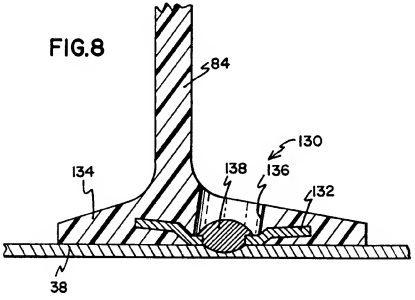


FIG. 8



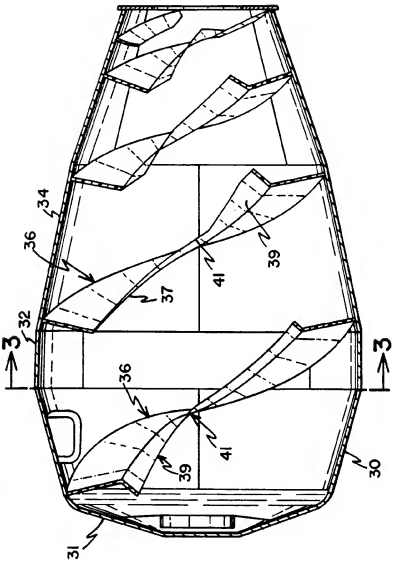


FIG.2

FIG. 3

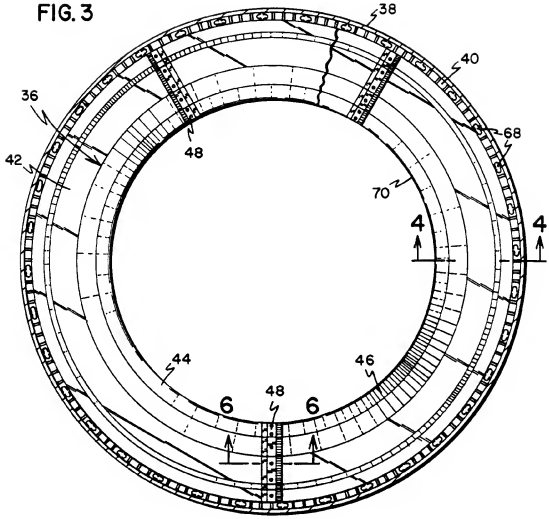
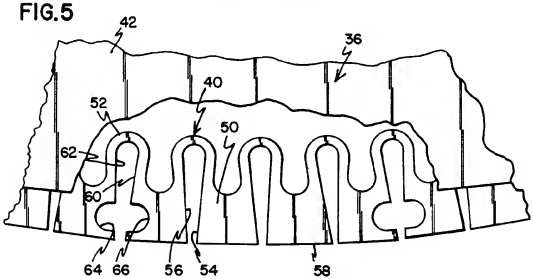


FIG. 5



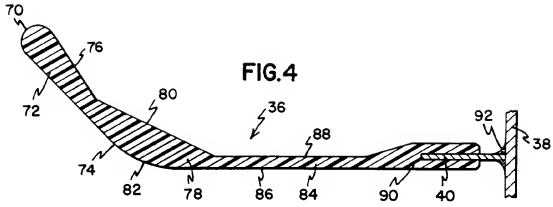


FIG.4

FIG.6

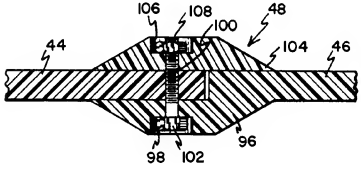


FIG.7